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XXII. *Observations of the Immersions and Emerfions of the Satellites of Jupiter, taken in the Year 1768, by Ensign George Sproule, of his Majesty's 59th Regiment, on the South Point of the Entrance of Gaspee Bafon, which bears from Cape Ferrilong, or the Cape forming the Bay to the Northward, N. 68 $\frac{1}{4}$  W. by the true Meridian, diftant 12 $\frac{1}{4}$  Marine Miles. Communicated by the Aftronomer Royal.*

Redde, Jan. 20, 1774. **T**HE observations were made with Mr. SHORT's reflecting telescope, and the times fhewn by a pendulum time-piece, made by Meflieurs MUDGE and DUTTON, firft adjusted to equal or mean time, by observing the paffage of Sirius through a gun barrel fixed in the plane of the meridian, with a contraction made in the bore of the barrel; and then proved, in its going, by correfponding and fingle altitudes, taken with HADLEY's quadrant, as often as the weather would permit, by reflection from clear oil, placed in a room with two windows; one to the S.E. and

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the other nearly S.W. adjacent to where the clock stood. The windows being high, and the Sun having no great altitude, during the time the observations were made, the oil was therefore placed at such a distance, from the windows, that no wind could get at it to disturb it. There was also every precaution used to render it as still as possible, by fixing a shed to windward without the windows.

The method I used, in taking all my corresponding altitudes, was first to screw the index to a certain altitude; then, for the morning observations, I first noted, when the upper limb, by reflection, touched the lower limb in the oil; secondly, when the centers coincided, by observing an equal coincidence in both images; and lastly, when the Sun's lower limb, by reflection, touched the upper in the oil. In the afternoon, I observed the Sun's falling, noting each contact corresponding to that in the forenoon. I always made it a rule to take a large number, that I might reject those, where the oil suffered the least agitation,

The clock was fixed to an upright steady post, in a warm room, kept as temperate as possible, by increasing or diminishing a large wood fire opposite the clock.

Notwithstanding every precaution, the intenseness of the cold was so great, that it frequently stopped the clock, by which I lost many observations during the months of January and February.

The following observations were made, when it was proved to go, at an equal rate, some days before and after.

The telescope and quadrant were the same Mr. Wright used on the island of Anticosti.

The ephemeris used was that of Mr. DE LA CAILLE, calculated for ten years to the meridian of Paris.

The telescope I had fixed on a steady stand without doors, near the room where the clock stood, and the time counted by a very careful person, with another to overlook him: great care was also taken of the quadrant, that it should not alter its adjustment between the morning and evening altitudes.

The latitude of the place of observation, at GASPEE, I determined, as accurately as possible, by several meridian altitudes of the Sun, taken in an artificial horizon, with the aforementioned quadrant; the error of adjustment being most accurately obtained by different methods. The mean result of the whole (15 of which agreed one with the other to 6 or 7 seconds) I found to be  $48^{\circ} 47' 32''$ . The variation of the needle, by repeated trials different ways, I found  $16^{\circ} 30'$  West; one of the meridian altitudes I insert, to shew the method I used.

[ 180 ]

15th May, 1768, double angle of } ° ' ''  
 meridian altitude of the Sun's up- } 121 10 0  
 per limb.

Error of adjustment of quadrant to } ° ° 35  
 the left,

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121 9 25

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Apparent altitude of Sun's upper limb, 60 34 42½  
 Semi-diameter subt. 15 51

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App. alt. of center, 60 18 51½  
 Refraction, 31

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60 18 20

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— 90 = Sun's zenith distance = 29 41 40  
 Sun's decl. reduced to the meridian }  
 of observation \*. 19 5 50

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Lat. of the S. Point of Gaspee Bason, 48 47 30

GEORGE SPROULE.

\* i. e. The ☉'s declination, at the time of his passing the observer's meridian, computed from tables adapted to another meridian, according to the known or supposed longitude of one meridian from the other. S. HORSLEY.

*Mr.*

*Mr. Sproule, in reducing the time of his clock, having neglected the equation of equal altitudes, it was necessary to re-compute the corrections; and here follow the immersions and emersions of Jupiter's satellites, reduced to apparent time, from the original observations, due allowance being made for the equation of equal altitudes, by the Astronomer Royal.*

		Apparent Time.			
		h	'	"	
1768					
Jan.	29. Im. 1.	13	57	47	
Mar.	15. Im. 1.	14	21	14	
	16. Im. 2.	11	59	7	
	Im. 3.	13	30	10	
April	9. Em. 1.	11	18	26	} N. B. In these two emersions, the satellites seemed to emerge slowly out of the shadow.
	10. Em. 2.	11	38	8	
	25. Em. 1.	9	39	40	} This is the best observation, the satellite starting out instantaneously.
May	9. Em. 1.	13	30	54	
	12. Em. 2.	11	15	43	